# Autocalibration release notes

Autocalibration in brief

Autocalibration has been re-engineered to allow a quick and reliable calibration of the gas system on the vehicle. Once installed the system and selected the main gas devices, after the idle calibration, the execution of the autocalibration enables a training mode, and after a petrol drive and a trial gas mode drive, the system is calibrated.
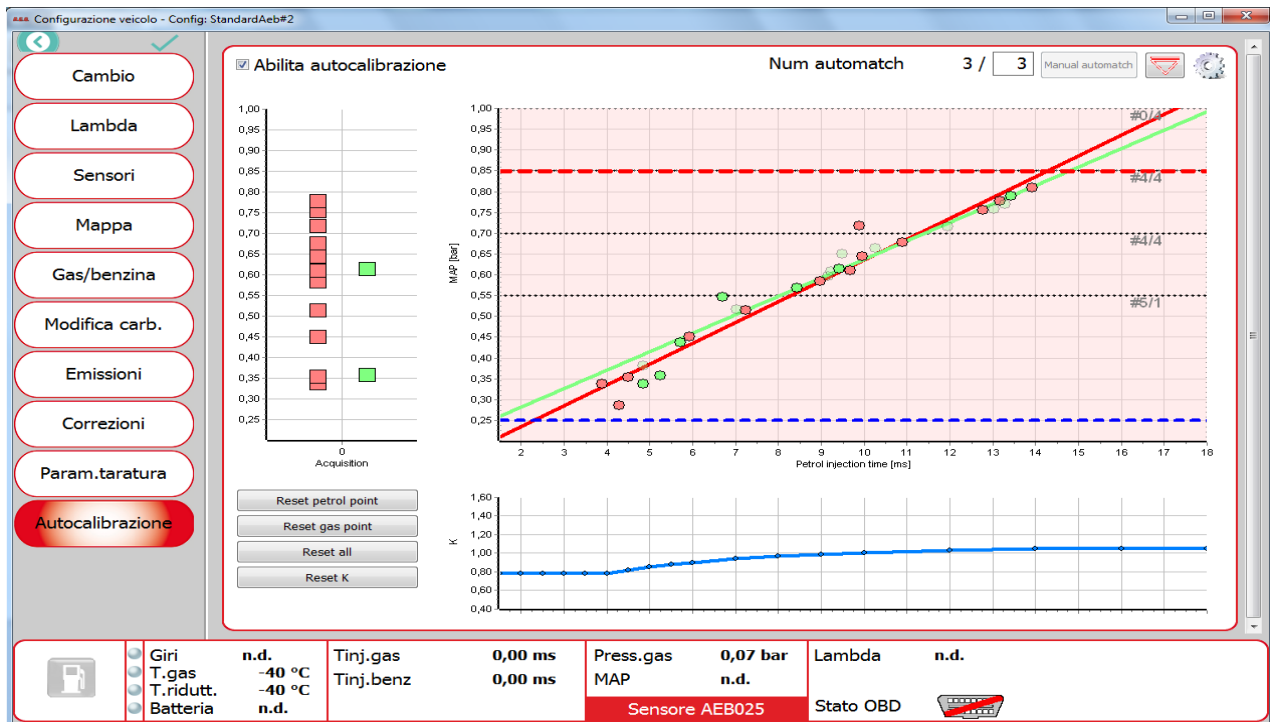
Appliance of Autocalibration

All the ECUs in the table below have the feature, or can be upgraded to have it, both for CNG and LPG fuels; missing ECU models are not compatible with the feature.

The ECU needs to be updated in the software at least at the following versions

MP32	Ver 5.63 or later
MP48	Ver 11.37 or later
MP48OBD	Ver 9.69 or later

The feature is available since PC Software Tool Version 6.07.00.06 or later.

If PC Tool connects to an ECU that doesn't run a firmware with the autocalibration feature, the Tool PC will disable the related buttons.

If you connect a PC Software Tool Version older than 06.07.00.06 and inside the Gas ECU there is the firmware version MP32 Ver 5.63 or later, MP48 Ver 11.37, MP48OBD Ver 9.69 the tool doesn't connect and advice you to update the software version.

Prerequisites to Autocalibration

In order to execute the procedure, gas equipment is supposed to be installed and tested, petrol and gas in the tanks, warm engine.

Hence should be executed a standard system calibration (fuel, engine, sensors, injectors,…) and specific vehicle strategies enabled, if necessary.
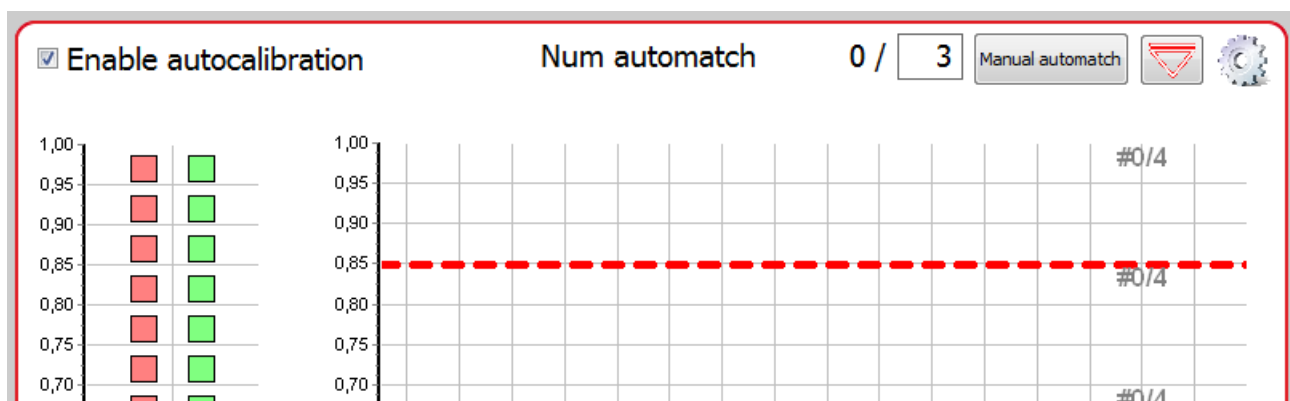
Autocalibration procedure

Start the IDLE AUTOCALIBRATION by selecting the command GO TO MIN CALIBRATION in the following menu with the Calibration PC tool connected to the ECU.
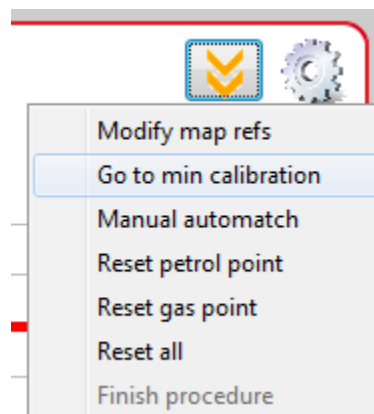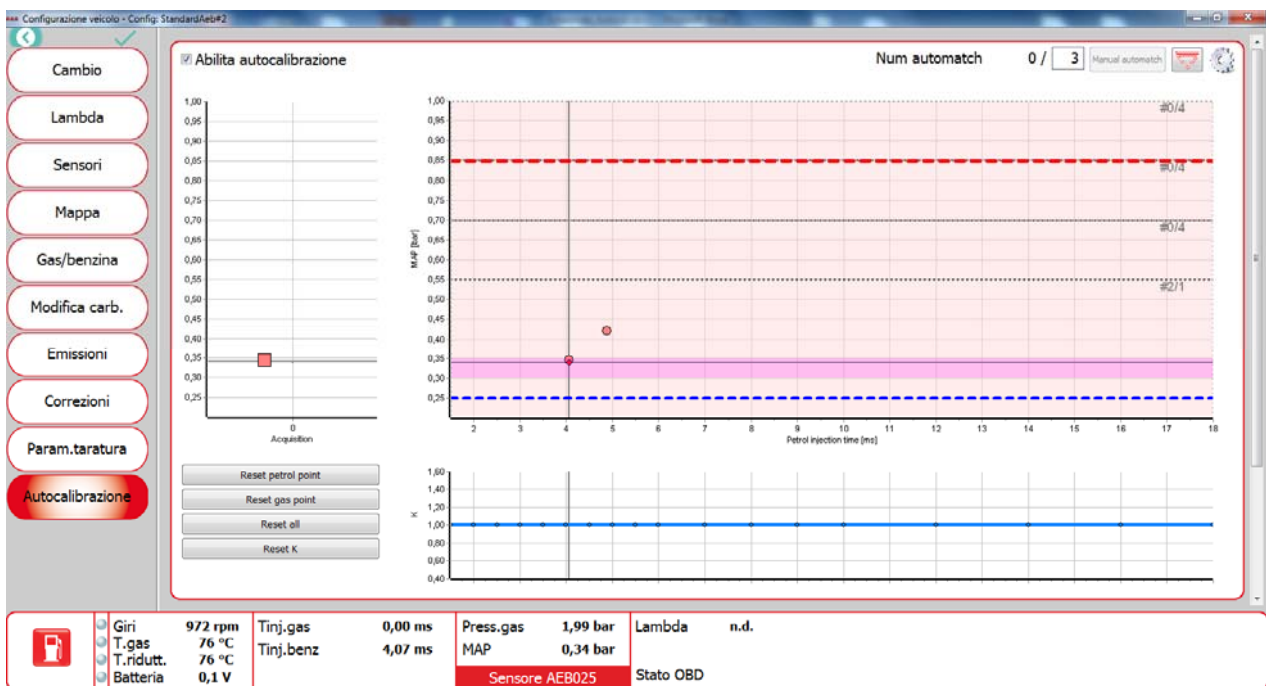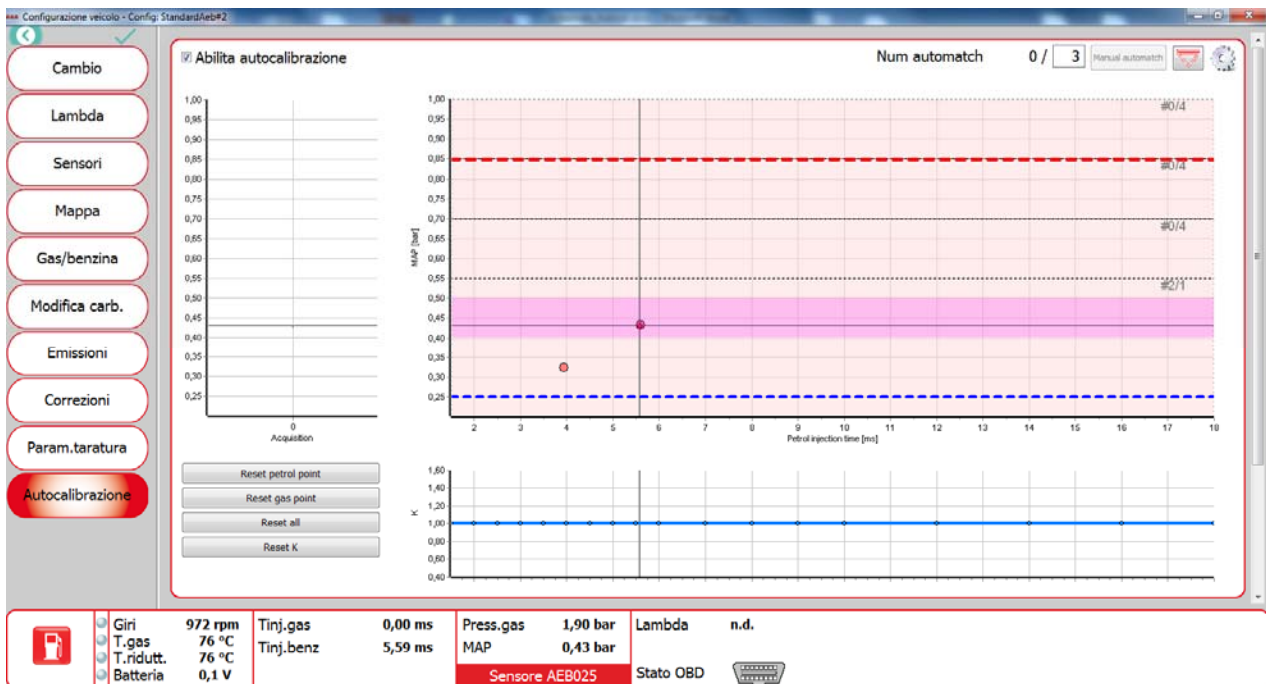

STEP ONE

ENABLE THE AUTOCALIBRATION by check the command on the top of the chart. The ECU will enter in a learning mode composed by several steps.

The **step one** consists driving in petrol mode, the system acquires samples in the Injection-time/Map space. The vehicle driver, driving the vehicle both at idle and on-road, must try to cover as much red dots as he can, until a red line is drawn. In this activity the PC software ease the acquisition suggesting which area still needs to be covered, or deleting mistaken samples.

Step one can be concluded as soon as the red line is plotted, but optionally the driver can refine the acquisition continuing the petrol drive.
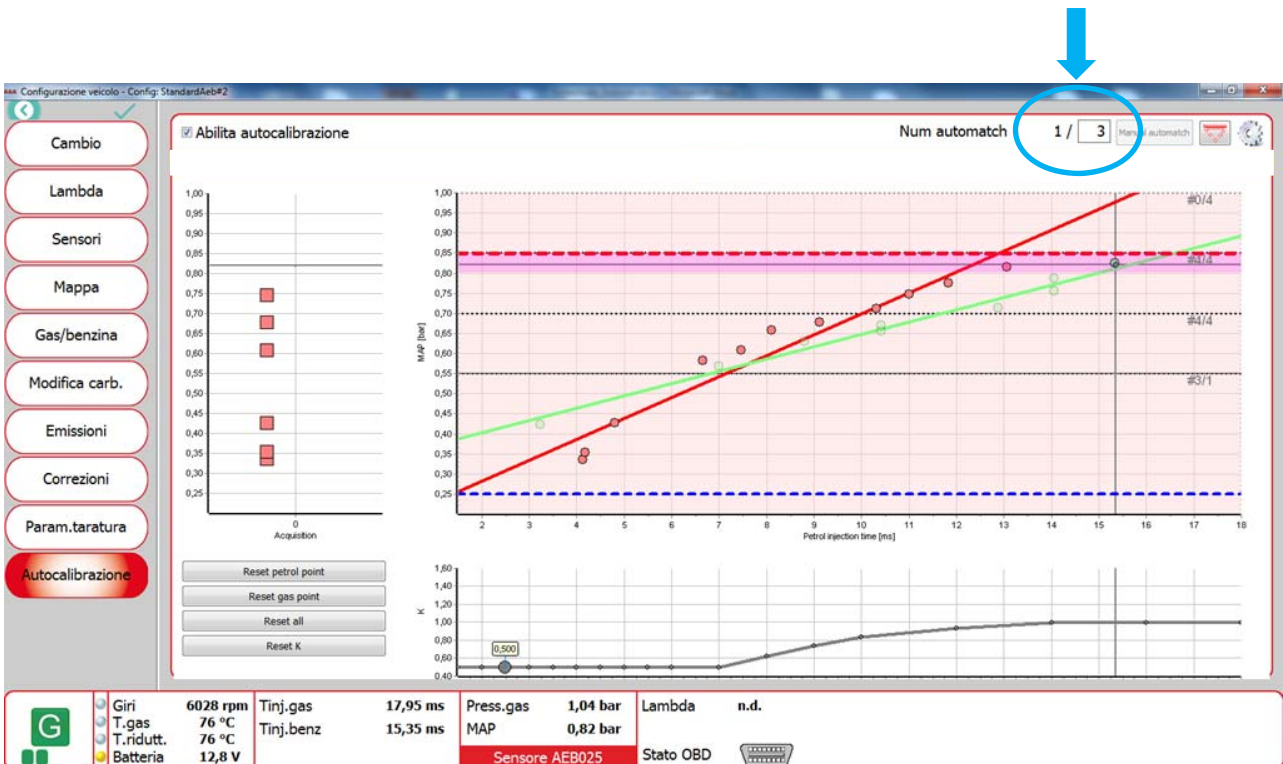
As soon as the driver switches to gas, the system runs **step two**

STEP TWO

Consist driving in gas mode (for a number of times calibrated in the "num automatch" value). As in **step one**, the user must drive in a trial gas mode, in order to acquire green dots and achieve the drawing of a line.

The system acquired the green line the first time

The procedure finishes as the number of automatch reaches the required number of executions; the autocalibration output is K Vector (blue line) different from the usual K map.

Autocalibration is an optional feature: it is possible

- to continue using K maps achieved manually, or saved in archived calibrations
- reset autocalibration K Factor vector
- re-execute totally or in part the procedure

Autocalibration software controls

- **Autocalibration enable**
  Enables the autocalibration feature. The most common use is to switch the control on, reset previous stored data, if present, then begin with the petrol-mode acquisition, until the systems completes the number of automatch. Then the system applies the K Factor values in the graph below.
  Note: if the Autocalibration is disabled, the system does not use the K Factor correction calculated in the autocalibration, so the enable flag must be switched to on permanently.

- **Num Automatch** (default 3)
  Is the number of iteration of the gas-mode acquisition. At each iteration the green line tends to the red line. The lower is the value, the quicker is the procedure; the higher the value, the longer will be the procedure, but more accurate in most cases.
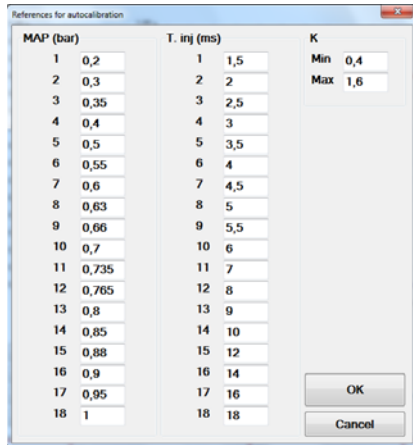
- **Manual automatch button**
  The button is automatically enabled in case of coherence of the acquired data; it causes the acquisition of the gas samples, going to the next automatch.

- **Scroll button**

  The button give access to a menu.
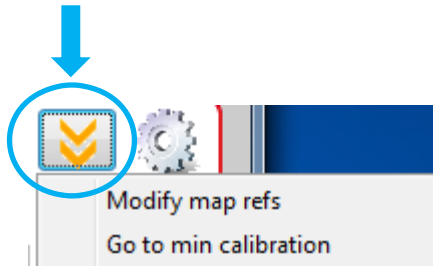
  - o **Modify map refs**: opens a setup window for the calibration of the references of the map, and the admitted range of the K.

  - o **Go to min calibration**: is a shortcut for the idle calibration. The same action can be taken quitting autocalibration and pressing F11.

- **Reset petrol point button**

  It resets completely the red dots dataset, and the red line, leaving green dots and K Factor line inaltered.
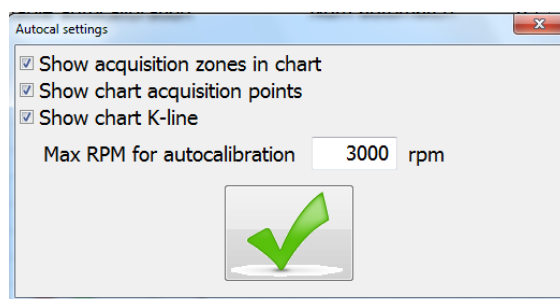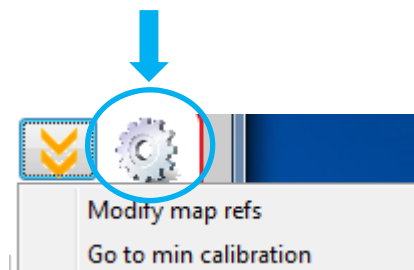
- **Reset gas point button**

  It resets completely the green dots dataset, and the green line, leaving petrol dots and K Factor line inaltered.

- **Reset all button**

  reset all the autocalibration dataset.

- **Autocalibration settings**

  Is a panel useful for the customization of the graph view and the maximum level for acquire point during the autocalibration.


MAP Chart items and controls:

The map chart is an active control, intended to reduce the time of completion of the autocalibration. It displays multiple data, and using the mouse actions the user can :

- Select and delete one or more dots
- Drag up and down the maximum MAP threshold
- Drag up and down the minimum MAP threshold
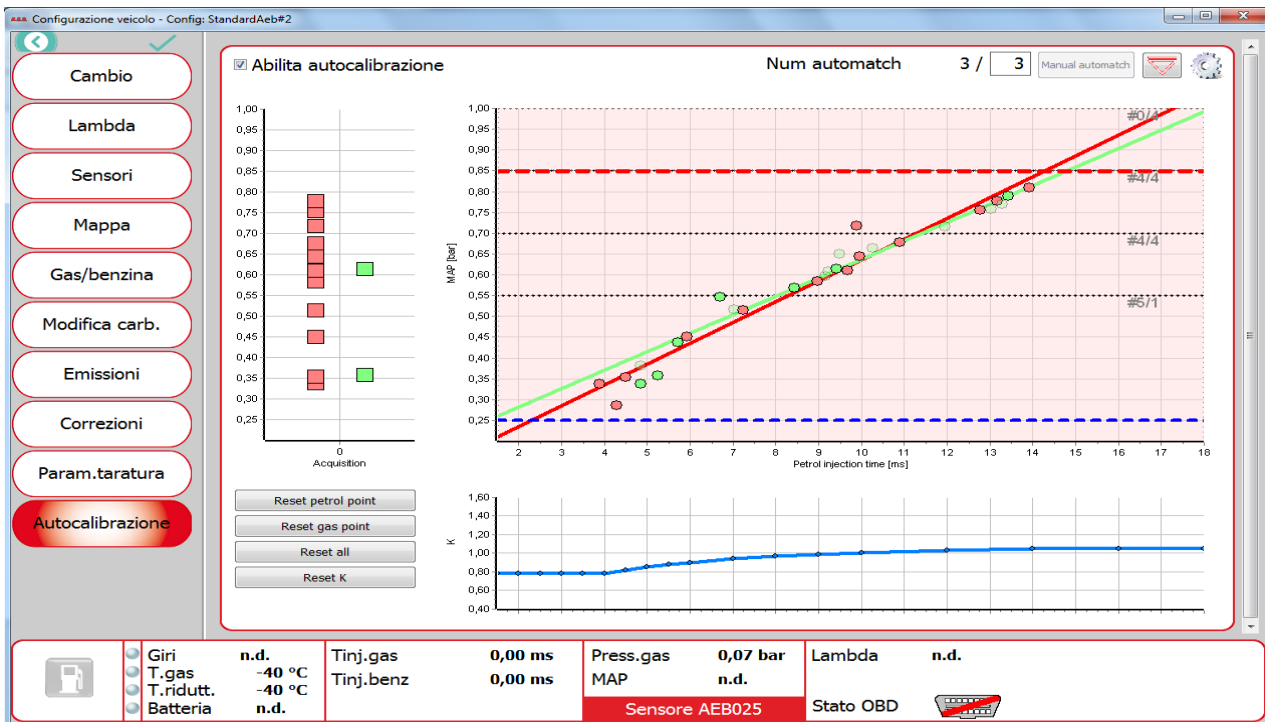
- **Red rhombus dot**: is the current working point of the acquisition. It is visible only if the ECU is connected and the engine is on, and the fuel is petrol.
  Around rhombus there is a highlighted line dark red, show you the subzone of the zone where you drive. You can collect one point for each subzone, there are 4 subzone for each one of them.
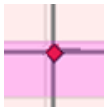
- **Green rhombus dot**: is the current working point of the acquisition. It is visible only if the ECU is connected and the engine is on, and the fuel is gas.
  Around rhombus there is a highlighted line dark red, show you the subzone of the zone where you drive. You can collect one point for each subzone, there are 4 subzone for each one of them.
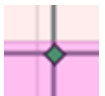
- **Green dots**: are the samples acquired during the trial gas mode.

- **Red dots**: are the samples acquired during the petrol mode.

- **Red square**: appear when you acquire 7 red dots in the same subzone, appear in the left chart. The zone become green if you have at least one red square.

- **Green square**: appear when you acquire 7 green dots in the same subzone, appear in the left chart. The zone become green if you have at least one green square.


- **Green line**: resulting line of the interpolation of the green dots. The line is not plotted until 3 of four slices of the graph are green colored. The slices will be red colored if there are not enough samples in the area, green colored otherwise.
- **Red line**: resulting line of the interpolation of the red dots. The line is not plotted until 3 of four slices of the graph are green colored. The slices will be red colored if there are not enough samples in the area, green colored otherwise.
- **Horizontal red dashed line**: maximum MAP threshold. Samples acquired above this line will be ignored. The line can be dragged with the mouse.
- **Horizontal blue dashed line**: minimum MAP threshold. Samples acquired below this line will be ignored. The line can be dragged with the mouse.
- **Horizontal gray dashed lines**: they split the chart in 4 zones. In order to plot the line 3 of 4 areas must be green. This is a useful suggestion that the driver can use to drive in that area, in order to shorten the procedure.
- **Red area color**: color of the slice that have still not enough dots to be properly sampled.
- **Green area color**: color of the slice that have enough dots to be properly sampled.

Acquisition graph: on the left side of the page is plotted a graph of squares, that gives the driver a quick idea of the coverage of the acquisition. The denser the squares in the two columns, the more accurate is the autocalibration. Optionally the chart can be hidden.

K Factor chart and controls: in the lower part of the page is the graph of the K factor, that is the output of the autocalibration procedure. The blue dots can be manually drag, changing the K correction within admitted range. By right-clicking the mouse on the graph, a popup menu allows the reset of the graph, and the export of the graph to a picture.
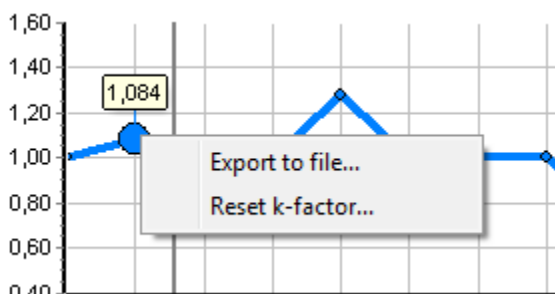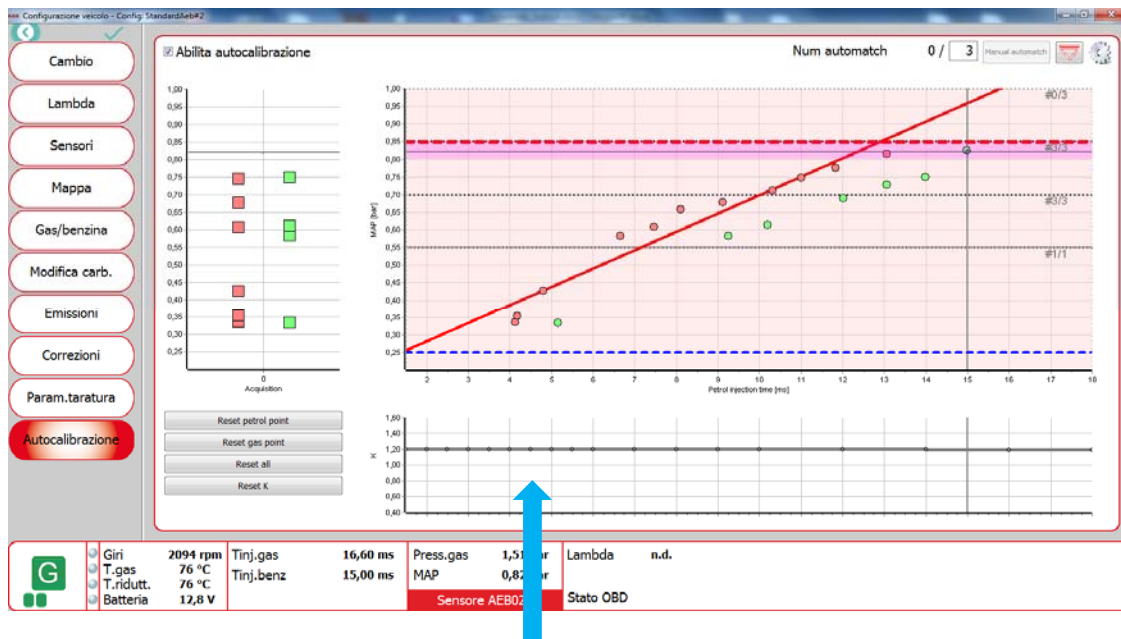
How the autocalibration works:

The maximum correction of the K-factor will be in the range maximum 1.5 minimum 0.5.

Every automatch can modify the K-factor ±20% in according to the previous value.

K-Factor = 1

In this example after the first automatch the maximum correction is +20% also if should be +40%
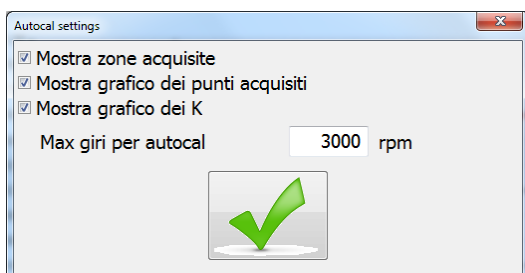
Maximum K-factor enrichment = 1.5

Minimum K-Factor enrichment = 0,5

In the software is set the rpm threshold 3000 rpm

If during the autocalibration the rpm will exceed this threshold of rpm, in petrol mode or in gas mode will apper a Warning

Warning you overtake 3000 rpm!!! Reduce the speed or change shift

You will have the same warning during gas mode or petrol mode

User interface and the software request for obtain a green zone.

We improve the user interface for semplify the autocalibration, we add for each zone the mimimum number of point you need to acquire and highlighted the subzone where you drive around the rhombus dot with an horizontal line in order to know where are you trying to take the dots.

For collecting all the points and obtain a green zone you will have to satisfy all the following requirement:
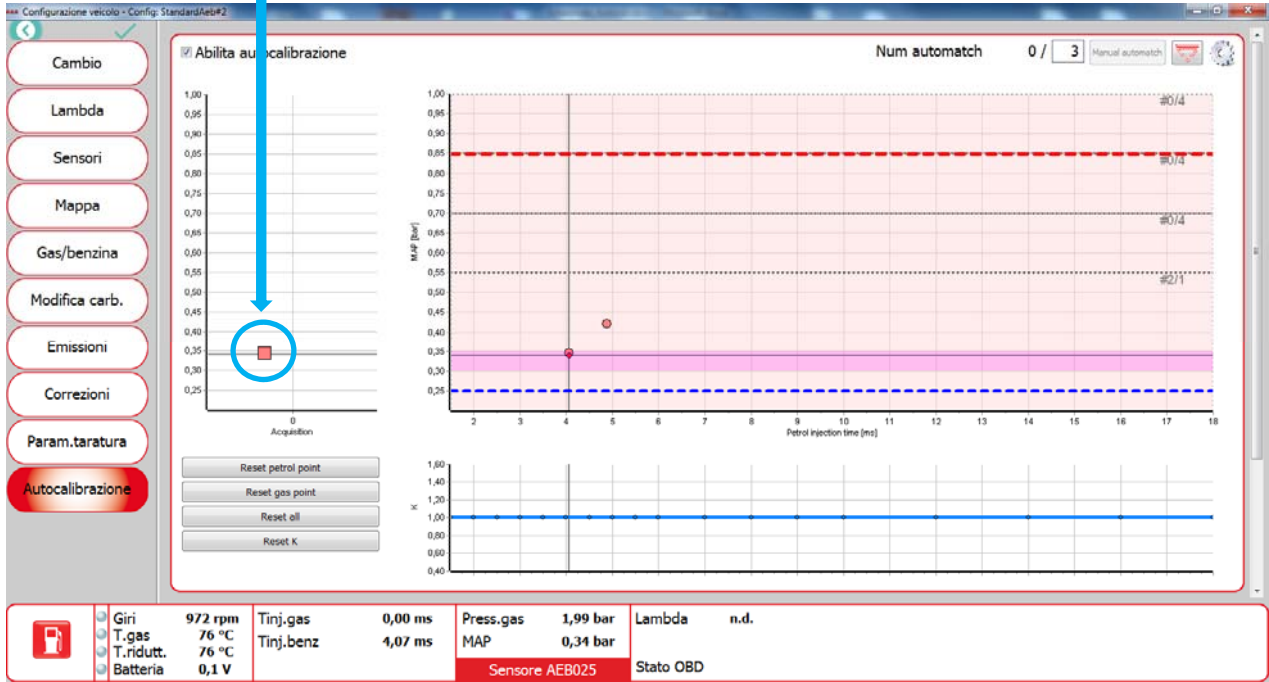
- Have the number of the dot equal to that one on the right of the zone chart #4/4
- One dot for each zone must be acquired ≥ 7 times and in the left chart will appear a square.

  [red square] during petrol mode or [green square] during gas mode

- The addiction of the number of the acquisition for every dots in each zone must be higher than the value set in the configuration, you cannot change it and it's less during gas acquisition and higher during petrol acquisition after that the zone will be green.

Number of dots to acquire for each zone.

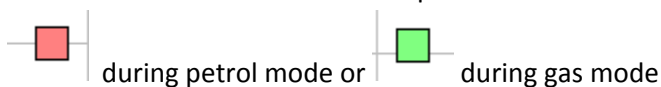Line highlighted for show the subzone where you will take the dot

Dot acquired 7 time or more

If you satisfy all the three requirements the zone become green

Requirements:

- Have the number of the dot equal to that one on the right of the zone chart #4/4
- One dot for each zone must be acquired ≥ 7 times and in the left chart will appear a square.

  during petrol mode or   during gas mode
- The addiction of the number of the acquisition for every dots in each zone must be higher than the value set in the configuration, you cannot change it and it's less during gas acquisition and higher during petrol acquisition after that the zone will be green.

In this case the zone is not green because you need to acquire one more dot as the indication suggest you